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Expression of immune-related genes during wound healing in fish

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Sterile tissue damage triggers the same pathways through damage-associated molecular patterns (DAMPs) that an infection does through pathogen-associated molecular patterns (PAMPs), albeit with different kinetics of expression of the involved genes. The cascade of reactions initiated by tissue damage starts with a series of non-transcriptional responses that leads to vasoconstriction and hemostasis. This is usually followed by an inflammatory response also initiated in the absence of transcription, but later greatly enhanced by expression of genes coding for proinflammatory cytokines and proteases. Inflammation is aimed at eradicating invading pathogens but causes concomitant tissue damage and this compromises regeneration. A strong inflammatory response often results in fibrosis and poor repair of the wound site, and is thus disadvantageous if the wound is uninfected. However, the inflammatory response is limited in early life stages of most animals, and these heal with a much higher degree of regeneration.

I will be presenting a selection of results from my PhD studies with a focus on the response to wounding during ontogeny of carp larvae and juveniles aged 7-56 days post-fertilization. The wounds of larvae completely regenerate within 3 days, whereas the wounds in juveniles are still visible 7 days post-wounding. Wound-induced changes in gene expression are limited, which may be ascribed to similarities between natural morphogenesis and tissue repair and that the investigated genes are thus already transcribed at adequate levels. However, expression of the mucosal immunoglobulin IgZ1 is upregulated in wounded larvae, indicating important innate effector functions of this isoform during early ontogeny.

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